Message

From: Cosler, Doug [DCosler@TechLawInc.com]
Sent: 4/19/2017 7:45:11 PM
To: 'Dan Pope' [DPope@css-inc.com]; Davis, Eva [Davis.Eva@epa.gov]; Bo Stewart [Bo@praxis-enviro.com]; Steve Willis [steve@uxopro.com]; Wayne Miller [Miller.Wayne@azdeq.gov]; Jennings, Eleanor [Eleanor.Jennings@parsons.com]; d'Almeida, Carolyn K. [dAlmeida.Carolyn@epa.gov]; Brasaemle, Karla [KBrasaemle@TechLawInc.com]
Subject: RE: Time of Remediation Estimates for EBR

As Bo pointed out in his earlier email today, a good way to address the effects of heterogeneities on remediation time frames is to use a lower mass-transfer coefficient for LNAPL dissolution (e.g., 0.005 1/days, or perhaps as low as 0.001 1/days). This type of 1st-order mass transfer model is identical to what dual-porosity and slow-desorption (from soil) transport models use to simulate rate-limited desorption from low-K (permeability) zones. Since most of the hydrocarbon mass is contained in the LNAPL, "ratcheting down" the LNAPL dissolution rate seems reasonable. Indeed, Bo and his colleagues point out in their J. Contaminant Hydrology paper (regarding the mass-transfer test at ST012) that the LNAPL dissolution rate is likely to reduce quite a bit in the upcoming years as the LNAPL saturation decreases and the related LNAPL globule/ganglia surface area reduces.

From: Dan Pope [mailto:DPope@css-inc.com]
Sent: Wednesday, April 19, 2017 3:24 PM
To: Davis, Eva <Davis.Eva@epa.gov>; Bo Stewart <Bo@praxis-enviro.com>; Steve Willis <steve@uxopro.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>
Subject: RE: Time of Remediation Estimates for EBR

Eva rightly says: "*I think at least part of the answer is in one of Doug's comments - 'field conditions will definitely not be well-mixed (e.g., highly-variable permeability) which means that the actual system will not perform as well" and that this should be emphasized up front*"

Pertinent comment from our earlier memo:

> *"Therefore, the extent and conformation of the NAPL in the aquifer, variability and type of aquifer materials, groundwater flow around the NAPL, solubility of the COCs, and other factors play a large part in how effective and timely bioremediation of NAPL might be. These factors make prediction of cleanup timeframes highly uncertain."* (September 26, 2014)

I'm not sure if AF understands this, though.

-----Original Message-----
From: Davis, Eva [mailto:Davis.Eva@epa.gov]
Sent: Wednesday, April 19, 2017 12:16 PM
To: Bo Stewart; Steve Willis; Wayne Miller; Jennings, Eleanor; d'Almeida, Carolyn K.; Dan Pope; Brasaemle, Karla; Cosler, Doug
Subject: RE: Time of Remediation Estimates for EBR

So - how comparable are the results from the two different modeling efforts? I admit I'm a skeptic - I am having a hard time believing the time ranges that Bo calculated, they still appear optimistic to me. If the bugs really could do that much, why did we do SEE at all?

I think at least part of the answer is in one of Doug's comments - 'field conditions will definitely not be well-mixed (e.g., highly-variable permeability) which means that the actual system will not perform as well" and that this should be emphasized up front

-----Original Message-----
From: Bo Stewart [mailto:Bo@praxis-enviro.com]
Sent: Tuesday, April 18, 2017 4:49 PM
To: Steve Willis <steve@uxopro.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-inc.com>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>
Subject: Time of Remediation Estimates for EBR

Hi All,

Steve asked me to go ahead and forward the attached memorandum. The memo describes modeling and calculations for the time to attain RAO-like results (averaged over the NAPL source zones) using EBR. The approach is similar to Doug's in his spreadsheet. The model description and mathematical equations (Appendix B) were reviewed by Michael Brooks at EPA ORD (excluding the Monod kinetics) when it was used in the FFS at the McCormack & Baxter Superfund site in 2014. It was also used for the FFS at the Wyckoff Superfund site. I had to add the Monod kinetics to make it applicable to EBR at ST012.

The model is only applied to the EBR targets defined in the Amec Worksheets for the NAPL remaining (LNAPL Volume Calcs Printable_Rev_030317). No attempt was made to evaluate the TTZ/TIZ since no viable mass estimate exists for the residual NAPL remaining after SEE.

For the assumed field conditions and the underlying model assumptions for Monod kinetics, the range of estimates for the LSZ is 8 to 23 years.
The calculated range for the UWBZ is 92 to 136 years. Allowing undefined improvements to yield a 10-fold increase to the utilization rates in the UWBZ resulted in a calculated range of 17 to 43 years.

Bo

--
Lloyd "Bo" Stewart, PhD, PE
Praxis Environmental Tech., Inc.